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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

STREGE, JOHN B

ART UNIT

PAPER NUMBER

2624

DATE MAILED: 08/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/683,836

Applicant(s)

BRUCE ET AL.

Examiner

John B. Strege

Art Unit

2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 March 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 and 36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 and 36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Response to Amendment/Arguments

The request for reconsideration received 3/8/06 has been received and considered in full. Applicant's arguments with respect to the claims have been considered but are moot in view of the new grounds of rejection.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-6,8-20, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. USPN 6,757,645 (hereinafter "Chang") in view of Cai et al. USPN 6,873,720 (hereinafter "Cai").

Chang discloses a method of evaluating the effect of defects on components in a semiconductor manufacturing process (col. 1 lines 19-22), comprising the steps of inspecting a component for defects using an inspection tool (400, col. 9 lines 60, see at least lines 6-10 of the abstract); recording defect inspection data from the inspection tool (storage device 447, col. 10 lines 10-24, col. 11 lines 43-57); accessing design data from a design data repository corresponding to the component being inspected (910 of figure 9, note that col. 20 lines 26-30 disclose that the system of figure 9 can operate the same as the system for figure 4); modifying said design data for the component according to said defect inspection data (col. 20 lines 60-67 discloses that a simulation of the wafer print of the portion of the design mask which corresponds to the portion

represented by the defect area image is simulated, simulation is a modification); analyzing said modified design data (col. 21 lines 9-34 discloses that the simulated image of the design data is compared to the simulated image of the physical mask, this is an analysis of the modified design data). Finally Chang discloses classifying (characterizing) the defects (col. 11 lines 47-50).

Chang does not explicitly disclose classifying the defects into critical and non-critical defects based on the analyzing and determine a final disposition of the component by applying different acceptance rules to the critical defects and the non-critical defects. It is noted however that Chang does disclose determining the severity of the characterized defects to accept, reject, or repair the mask, see figure 11.

Cai incorporates by reference the application (now a patent) of Chang (col. 2 lines 47-51). Cai recites that the problem with Chang is that a customer must review the information to make a determination regarding the appropriate action to take such as repairing the mask or fabricating a new mask, and this leads to human error (col. 3 lines 25-29). To improve on this Cai discloses a system for providing defect printability analysis for an integrated circuit mask which corrects this problem. Cai discloses identifying critical and non-critical regions of the integrated circuit (514, col. 14 lines 49-61, and col. 8 lines 45-67) and using this information in addition to the simulated data in the defect printability analysis generator 515 to characterize (classify) the defects as substantial or unsubstantial (critical or non-critical, col. 9 lines 3-8). Finally Cai discloses that the determining a final disposition of the component can be done by applying different acceptance rules to the critical defects and the non-critical defects (col. 9 lines

48-50). It is noted that Cai discloses that this is computationally intensive to apply different rules, however it shows that it is well known that this could be done.

Chang and Cai are analogous art because Chang incorporates the Cai reference.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Chang and Cai to classify the defects into critical and non-critical based on the analyzing and determine a final disposition of the component by applying different acceptance rules to the critical defects and the non-critical defects. The motivation would be to reduce human error by making the process automatic. Thus it would have been obvious to one of ordinary skill in the art to combine Chang and Cai to obtain the invention as specified in claim 1.

Regarding claim 2, as discussed Cai discloses that the invention is for mask inspection.

Regarding claims 3, and 6 Chang discloses that the mask comprises opaque areas and clear areas (col. 2 lines 20-38) and that a defect printing depends greatly on its location, size, and transmission/reflection characteristics (col. 4 lines 10-29). Thus it would be obvious to include if the defect is clear or opaque with the defect data to determine the importance of that part of the mask.

Regarding claims 4-5, Cai discloses that the final disposition of the mask being inspected includes scrapping the mask, repairing the mask, or accepting the mask and determining whether a defect is likely to cause failure (paragraph bridging cols. 17-18).

Regarding claim 8, as discussed Chang discloses a design layout database but does not explicitly disclose that the database is suitable for storage of large files. However it would be obvious to use a database suitable for storage of large files and therefore the examiner declares official notice. The motivation for using a database suitable for storage of large files is that it could contain information for different types of masks.

Regarding claim 9, Chang discloses that the design image simulator 960 simulates a defect shape for the mask layer being inspected corresponding to defects from said defect detection processor 925.

Regarding claim 10, Chang discloses that different mask layers are used to produce the semiconductor device with various layers and shows an effective method for inspecting a layer of the mask. Chang does not explicitly disclose analyzing both intra-level and inter-level problems of the mask layer, but it would be obvious to do so in order to accurately determine the defects of the mask which are important with respect to the desired representation of the photo-resist material etched into the silicon (col. 3 lines 39-61).

Claim 11 is similar to claim 1, except claim 11 discloses that a mask region is inspected. As discussed above both Chang and Cai are for inspecting a mask region.

Claim 12-14 are similarly analyzed as claim 4.

Regarding claim 15, Cai discloses using heuristic rules to determine if the defect will be resolved onto the wafer (col. 13 lines 25-67).

Claims 16-18 are similar to claims 11-13 except claims 16-18 are system claims thus they are similarly analyzed and rejected.

Claims 19-20 are similar to claims 11-12 except claims 19-20 are computer readable medium claims, thus they are similarly analyzed and rejected.

Claim 36 is similar to claim 1 with the main difference being that the shapes are generated representing the defects. A defect inherently has a shape. As Chang and Cai disclose simulating the defect on the mask as it would appear, this means that the shape of the defect on the mask will be used to generate a shape that will represent how the defect would look. Thus claim 36 is similarly analyzed to claim 1.

3. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. USPN 6,757,645 (hereinafter "Chang") in view of Cai et al. USPN 6,873,720 (hereinafter "Cai") and further in view of Mansfield et al. USPN 5,965,306 (hereinafter "Mansfield").

Chang discloses creating a simulated wafer image of a defect 970 and merging the image into a simulated wafer image (as seen by 2030 of figure 20. Chang does not explicitly disclose that the defect inspection data comprises intensity contour plots.

It is well known in the art of mask inspection to use the inspection tool AIMS which produces intensity contour plots.

Mansfield discloses that a standard mask inspection/repair process entails incorporating the defect size criterion of the device manufacture into the inspection tool

and that advanced mask maker may utilize the AIMS tool to facilitate this process (col. 4 lines 30-46).

Cai, Mansfield and Chang are all analogous art because they are from the same field of endeavor of mask inspection.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Cai, Mansfield and Chang to use the AIMS inspection tool thus producing intensity contour plots in order to facilitate the inspection process. Thus it would have been obvious to combine Cai, Aloni, Mansfield and Chang to obtain the invention of claim 7.


Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B. Strege whose telephone number is (571) 272-7457. The examiner can normally be reached on Monday-Friday between the hours of 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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